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EXAMINER	
WATKO, JULIE ANNE	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Examiner-Initiated Interview Summary	Application No.	Applicant(s)	
	10/805,354	HATTORI ET AL.	
	Examiner	Art Unit	
	Julie Anne Watko	2627	

All Participants:

(1) *Primary Examiner Julie Anne Watko, AU 2627.*

(2) *Moshe K. Wilensky, Reg. No. 56263.*

Status of Application: *final*

(3) _____.

(4) _____.

Date of Interview: *9 January 2008*

Time: *9:22PM*

Type of Interview:
- ☒ Telephonic
- ☐ Video Conference
- ☐ Personal (Copy given to: ☐ Applicant ☐ Applicant's representative)

Exhibit Shown or Demonstrated: ☐ Yes ☒ No
If Yes, provide a brief description:

Part I.

Rejection(s) discussed:

Claims discussed:

Prior art documents discussed:
JP 57-3228 A

Part II.

SUBSTANCE OF INTERVIEW DESCRIBING THE GENERAL NATURE OF WHAT WAS DISCUSSED:
The Examiner left a voice mail message notifying Applicant's representative that a translation of JP 57-3228 A has become available. A copy is attached.

Part III.

- ☐ It is not necessary for applicant to provide a separate record of the substance of the interview, since the interview directly resulted in the allowance of the application. The examiner will provide a written summary of the substance of the interview in the Notice of Allowability.
- ☒ It is not necessary for applicant to provide a separate record of the substance of the interview, since the interview did not result in resolution of all issues. A brief summary by the examiner appears in Part II above.

JULIE ANNE WATKO
PRIMARY EXAMINER

01/09/2008

(Examiner/SPE Signature) (Applicant/Applicant's Representative Signature – if appropriate)

PTO 08-1454

CC=JP DATE=19820108 KIND=A
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MAGNETIC DISK
[JIKI DISUKU]

Yoshitsugu Kitamura

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APPLICANT	(71):	NEC CORP
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Specification /1*

1. NAME OF INVENTION

MAGNETIC DISK

2. CLAIMS

Magnetic disk, having a rotating magnetic disk and magnetic head for recording and reproduction of digital data,

which, at least on the data recording area of said magnetic disk, has an easy-magnetization magnetic layer for recording given data,

whose magnetism can be varied according to prescribed external magnetic field corresponding to said given data, and

also has a high-retaining magnetic layer of discrete servo magnetic pole units for pre-recording indestructible data necessary for positioning,

whose magnetic polarity is not changed by the external magnetic field accompanying above-mentioned data writing process.

3. DETAILED DESCRIPTION OF THE INVENTION

This invention relates to magnetic disk storage device, and especially to bit isolation type magnetic disk media structure appropriate for high density digital storage.

Traditionally, magnetic disk storage device used to store data on magnetic disk not by assigning independent memory cell for each bit, but by assigning given intervals corresponding to the storage data pattern against the time axis on continuous magnetic film physically connected

*Number in the margin indicates pagination in the foreign text.

in one direction. This was an analog recording method that contained certain variation component against the time axis.

Therefore, it was rather difficult to improve the recording density, or the bit density, in the direction of the time axis. Additionally, /2 since there was no means to indicate positions between multiple concentric recording tracks on the same disk surface, it was also difficult to improve the recording density in the radial direction, namely the track density.

The objective of this invention is to provide a magnetic disk that is capable of high density storage by overcoming above-mentioned problems. The above-mentioned problems are resolved by arranging servo magnetic elements capable of holding special information which would not change during normal data writing, wherein said special information indicate the position of each bit cell of stored data. This allows assignment of each bit memory cell, in the direction of the time axis on the selected data track, as independent memory cell. Further, this also can provide position detection information of each track in the radial direction.

This invention provides a magnetic disk with a magnetic surface structure of magnetic disk storage device for storing given data, which has, on the same magnetic disk surface, not only an easily-magnetized magnetic layer which can change its magnetic polarity to specified value according to prescribed external magnetic field for writing corresponding to said given data, but also a high-retaining magnetic layer, which cannot be influenced by the power of external magnetic field for writing the given data, wherein sufficient number of servo magnetic elements are distributed

to provide information on physical storage location of the given data.

An embodiment of this invention is explained next using illustrating drawings. In Figure 1, an embodiment of this invention has storage areas allocated on the same plane along the concentric circles around its rotational axis center point 'P' on the magnetic disk 10. These areas are, from the outside to the inside, outside non-data area 11, data storage area 12, and inside non-data area 18. Specifically, the data storage area 12 has a servo track structure having servo magnetic polar elements 100, 101, 102, ... Total of m elements of these are located along each concentric circle at a constant interval as indicated by B_0, B_1, B_2, ... , B_{m-1}, B_m, and these elements are located in the radial direction as indicated by C_0, C_1, C_2, ... , C_n at another prescribed interval.

Figure 2 shows the details of A section of Figure 1. In order to better understand the above-mentioned servo track structure, Figure 2 shows simplified picture of servo magnetic polar elements. These servo magnetic polar elements, placed non-continuously, are made from high-retaining magnetic material for retaining non-destructible special information ("servo information" hereafter) necessary for positioning, whose magnetic polarity is not changed by external magnetic fields. Servo magnetic polar elements 100, 101, 102, ... along the servo track C_0 are placed at points corresponding to reference bit locations B_1, B_2, ... , B_{m-1}, B_m, total of m per each circle. In a similar fashion, servo magnetic polar elements 110, 111, 112, ... along the adjacent servo track C_1, and servo magnetic elements 120, 121, 122, ... along the servo track C_2 are placed in the similar mutual

relationship as were on the servo track C_0. And the similar servo magnetic polar element placement structure repeats through the servo track C_n.

Figure 3 shows the detail of part of one embodiment shown in Figure 2, showing specific cross-section structure example of magnetic disk 10. This magnetic disk 10 is composed from servo magnetic pole element layer 21 of high-retaining magnetic material 21 on top of basically non-magnetic disk baseboard 10, and easily-magnetized magnetic material 22 uniformly formed on the servo magnetic pole element layer to fill gaps of servo magnetic pole element layer 21.

The difference between the high-retaining magnetic material 21 and the easily-magnetized magnetic material 22 is in their magnet retaining power. Namely, external magnetic field with less than prescribed strength can change the magnetic polarity of the easily-magnetized magnetic material 22, while that same external magnetic field does not change magnetic polarity of high-retaining magnetic material 21.

When the magnetic disk 10 of this embodiment explained above is used for recording and reproduction of digital data with a magnetic disk storage device, normally the easily-magnetized magnetic material 22 between the servo track C_0 and the servo track C_1 is used as the first data track, for example. And the magnetized area surrounded by 4 servo magnetic pole elements in front/back and in the adjacent location is uses as a storage area for one bit. This is called a bit storage cell.

In this manner, bit storage cells can be identified easily. For example, the bit storage cell 200 is surrounded by servo magnetic pole

elements 100, 101, 110, and 111. Similarly, the bit storage cell 201 is surrounded by servo magnetic pole elements 101, 102, 111, and 112.

This invention, as was explained above, enables clear identification of the location of each bit storage cell and enables high density /3 storage by appropriately placing on the data storage surface, for each bit, servo magnetic pole elements that cannot be disturbed by normal data writing process.

4. BRIEF DESCRIPTION OF THE DRAWING

Figure 1 shows the overview of one embodiment of this invention.

Figure 2 shows the detail of part A of Figure 1.

Figure 3 is a cross-section structure of the section shown in Figure 2.

P … Rotation axis center; 10 … Magnetic disk; 11 … External non-data area; 12 … Data storage area; 18 … Internal non-data area; 20 … Disk baseboard; 21 … High-retaining magnetic material; 22 … Easily-magnetized magnetic material; 100, 101, 102, 110, 111, 112, 120, 121, 122 .. Servo magnetic pole element; 200, 201, 210, 211 … Bit storage cell.

Figure 1:

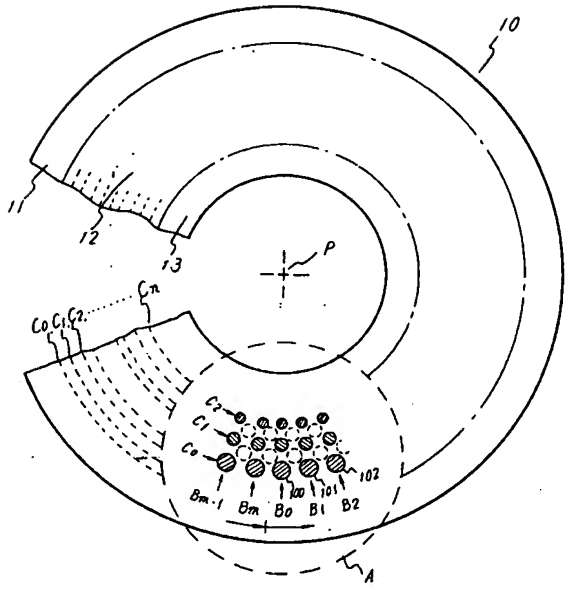

Figure 2:

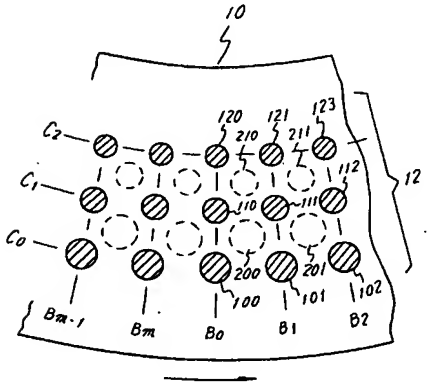

Figure 3: